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*Original Article*

# Value of ultrasound-guided transabdominal fine-needle aspiration cytodiagnosis for pelvic cystic and solid masses

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**Abstract:** *Background:* Pelvic cystic and solid masses are the common gynecological diseases. Fine-needle aspiration cytodiagnosis (FNAC) is a well-established method of tissue diagnosis for lesions in the body. This study aimed to evaluate the value of ultrasound-guided transabdominal FNAC in the diagnosis of pelvic cystic and solid masses. *Methods:* Sixty-eight patients with mixed pelvic cystic solid masses from January 2009 to June 2015 were enrolled in this study. The ultrasound-guided transabdominal FNAC was performed on the patients. The puncture outcome was determined. The pathological diagnosis was performed on the aspirate by puncture. *Results:* In 68 patients, 65 cases were successfully performed with one-time FNAC. The satisfaction rate of sampling was 95.6%. The pathological diagnosis showed that, 54 cases (79.4%) had malignant lesions, 4 cases (5.9%) had suspicious malignant lesions, 3 cases (4.4%) had benign lesions, 4 cases (5.9%) had lesions with undefined nature, and 3 cases (4.4%) had no effective cellular component in the aspirate (existence of blood component). After puncture, 1 case presented pale complexion, palpitation and sweating after puncture. In other 67 patients, no serious complication such as bleeding, infection or major organ injury appeared. In 68 patients, excepting 2 cases of pancreatic cancer metastasis giving up treatment, the remaining 66 cases received open surgery and suitable treatments. *Conclusion:* The ultrasound-guided transabdominal FNAC is a rapid, safe, practical and highly-effective diagnostic method for mixed pelvic cystic solid masses, which is worthy of popularization in primary hospitals.

**Keywords:** Ultrasound, FNAC, pelvic cystic and solid masses, diagnosis

## Introduction

In clinical practice, many patients often receive treatment due to pelvic masses. The pelvic masses have wide sources and varied natures, which can be the inflammation lesion [1], or tuberculosis lesion [2], or the benign and malignant tumors originating from other tissues [3, 4]. Modern evidence-based medicine proposes that, the tumors should be definitely diagnosed before treatment, and this is also suitable for pelvic cystic and solid tumors. The pelvic masses with different nature require different treatment methods. Early clarifying the pathological characteristics of pelvic masses has important significance for the choice of treatment scheme and judgment of prognosis [5]. Fine-needle aspiration cytodiagnosis (FNAC) is a well-established tissue diagnosis method for lesions in the body [6, 7]. In the past, considering that the abdominal puncture biopsy of pelvic masses may lead to peritoneal implantation metastasis of malignant tumors [8], the FNAC is not applied to pelvic masses. With the great improvement in imaging quality of ultrasound device and continuous raise in technical level of operators, the ultrasound-guided FNAC is gradually widely used in the diagnosis of pelvic lesions. Many reported literatures are focused on the application of FNAC of pelvic solid tumors [9, 10], but less on mixed cystic and solid masses. This study investigated the application value of FNAC for mixed cystic and solid masses. The objective was to provide a reference for the further clinical application of FNAC to diagnosis of pelvic masses.

## Subjects and methods

### *Subjects*

A total of 68 patients who were diagnosed with mixed pelvic cystic solid masses by imaging examination and performed with ultrasound-guided transabdominal FNAC in Zhejiang Tumor Hospital (Hangzhou, China) from January 2009 to June 2015 were enrolled in this study. There were 4 males and 64 females. Their ages were 20-84 years, with average age of 49.6±4.8 years. Forty-one cases had history of malignant tumor, 45 cases had surgical history, and 31 cases were complicated with less volume of ascites. This study was approved by the ethics committee of Zhejiang Tumor Hospital. Written informed consent was obtained from all participants.

### *Preoperative preparation*

Before surgery, the blood routine test, blood coagulation function test, electrocardiograph and biochemical examination were performed on the patients. The correction was conducted on patients with bleeding tendency and poor coagulation function, and the FNAC was performed only after the blood coagulation function became normal. The ultrasound examination was performed again to observe the size, shape, boundary, internal echo and blood flow distribution of masses, their relationships with surrounding large vessels, and ascites and its volume. In addition, the contraindications of patients were evaluated.

### *Puncture operation*

The puncture was performed in the ultrasound interventional room. The patient was in supine position. Logiq E9 color Doppler ultrasound diagnostic instrument with convex array probe (2.8-5.0 MHz) and linear array probe (9.0-15.0 MHz) (GE Inc., USA) was used to explore the masses and determine the puncture site. 21 G * 200 mm or 22 G * 200 mm puncture needle (Hakko Medical Inc., Japanese) was used to puncture. The puncture site was selected by avoiding the large blood vessels, bladder and bowel, and making the needle tip to contact the substantial part of cystic masses with abundant blood supply. If necessary the preoperative ultrasound contrast was used to observe the perfusion of contrast agent. The puncture should be at the position with large perfusion. The puncture site was marked on the body surface.

After conventional disinfection, 5 mL of 2% lidocaine was used for local infiltration anesthesia. Under ultrasound guidance, the puncture needle was inserted into the masses from the marked site and through the originally set path. When the ultrasonic image displayed that the needle tip had reached the masses, the needle core was drawn out, and a 5 mL disposable syringe was connected for aspiration with 1-2 mL negative pressure. After multi-point and multi-direction puncture and aspiration for 4-6 times, the biopsy sample was obtained. After sampling, the puncture needle was pulled out, followed by disinfection of puncture point and covering with application. The puncture point was pressed for 8-10 min. The patient was observed for 30 min, and returned to the ward after confirming no adverse reaction.

### *Pathological diagnosis*

The aspirate by puncture was sprayed on the glass slides for preparing the smear, followed by fixation using 95% alcohol solution. For preparing the cell wax blocks, the aspirate was directly fixed using 95% ethanol solution. The repeated sampling was performed according to the amount of sample. In this study, 64 cases were performed with puncture for one time, and 4 cases for twice. The pathology application form was written in detail, with description of primary disease, duration, clinical manifestations, imaging performance and laboratory test. The hematoxylin-eosin staining was performed on the smears paraffin. The centrifugal precipitation was performed for block specimens. If necessary the immuno-histochemistry assay was performed to achieve the purpose of diagnosis.

## Results

### *General information of patients*

The preoperative color Doppler ultrasound showed that, the mass size of 68 patients was 2-22.5 cm, with 2-5.0 cm in 18 cases, 5.0-10 cm in 38 cases, 10.0-15.0 cm in 9 cases and > 15.0 cm in 3 cases. Forty-nine cases were with single tumor mass, and 19 cases were with multiple tumor masses. Eight cases presented

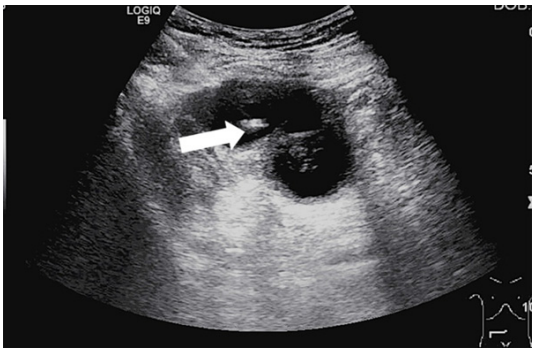

**Figure 1.** Puncture of pelvic cystic and solid mass (the arrow showed the needle tip in the solid part); the final pathological diagnosis showed ovarian serous cystic carcinoma.

**Figure 2.** Puncture of pelvic cystic and solid mass (the arrow showed the needle tip in the cystic part for aspiration); the final pathological diagnosis showed ovarian serous cystic carcinoma.

mutual integration of mass, with unclear boundaries.

*Puncture outcome*

In 68 patients, 65 cases were successfully performed with one-time FNAC. The pathological examination was not successfully conducted in 3 cases due to existence of blood component in aspirate. The satisfaction rate of sampling was 95.6%. The typical successful puncture operations were shown in **Figures 1** and **2** (the same patient) and **Figures 3** and **4** (the same patient).

*Pathological diagnosis results*

In 68 patients, 54 cases (79.4%) had malignant lesions, 4 cases (5.9%) had suspicious malignant lesions, 3 cases (4.4%) had benign lesions, 4 cases (5.9%) had lesions with undefined

**Figure 3.** Puncture of pelvic cystic and solid mass; FNAC showed papillary tumor.

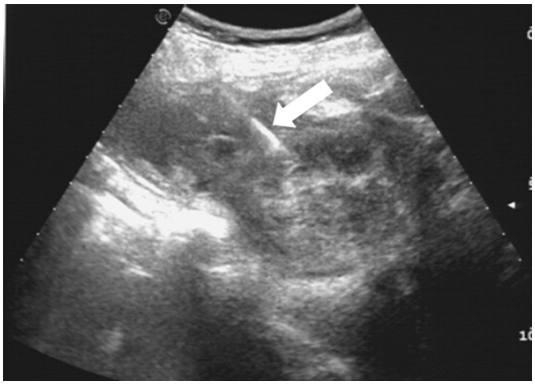

**Figure 4.** Puncture of pelvic cystic and solid mass pelvic cystic solid mass (the arrow showed the needle tip in the solid part), the final pathological diagnosis showed ovarian papillary cystic carcinoma.

nature, and 3 cases (4.4%) had no effective cellular component in the aspirate (existence of blood component) (**Table 1**).

In 54 cases of malignant lesions, there were 13 cases of primary pelvis malignant tumors (9 cases of ovarian cancer, 2 cases of malignant lymphoma, 1 case of rectal cancer, 1 case of colon cancer) and 41 cases of metastatic malignant tumors (15 cases of cervical cancer, 11 cases of ovarian cancer, 8 cases of gastrointestinal tract cancer, 4 cases of endometrial cancer, 2 cases of pancreatic cancer, and 1 case of bladder cancer. In 41 cases of metastatic malignant tumors, the ultrasound only found the irregular cystic mass and medium volume of effusion in abdominal cavity in 2 cases. These 2 cases were primarily diagnosed with ovarian malignant tumors, but the FNAC

**Table 1.** FNAC pathological diagnosis results

| | Number | % |
|---|---|---|
| Malignant lesions | 54 | 79.4 |
| Suspicious malignant lesions | 4 | 5.9 |
| Benign lesions | 3 | 4.4 |
| Lesions with undefined nature | 4 | 5.9 |
| No effective cellular component | 3 | 4.4 |

FNAC, fine-needle aspiration cytodiagnosis.

showed the metastatic adenocarcinoma, and the endoscopy confirmed that the metastasis was from the gastric cancer to the ovary.

In 4 cases of suspected malignant lesions, the scattered immature lymphocytes were seen in 2 cases, so the malignant lymphoma waited for exclusion. The coarse needle biopsy was performed, which showed the B-cell non-Hodgkin's lymphoma. The other 2 cases presented papillary epithelial tumor cells, so the papillary carcinoma was considered firstly. The second FNAC showed the papillary adenocarcinoma.

In 4 cases with lesions with undefined nature, only a small amount of degenerative cells were seen. In 3 cases with benign lesions, 1 case presented uterine fibroids combined with partial cystic lesion by postoperative pathological diagnosis; 2 cases presented inflammatory cells, and the mass disappeared after 3 months of anti-inflammatory treatment. For 3 cases with no effective cellular component in the aspirate, the patients gave up treatment due to malignant tumor history and multiple tumor metastasis in the whole body.

*Postoperative management and complications*

In 68 patients, 1 case presented pale complexion, palpitation and sweating after puncture. Considering the diabetes history and hypoglycemia response, the active treatment was given, and then the symptoms were alleviated. In other 67 patients, no serious complication such as bleeding, infection or major organ injury appeared. The follow-up after puncture was performed for more than 12 months, and no metastasis in the puncture path was found.

*Treatment outcome*

In 68 patients, excepting 2 cases of pancreatic cancer metastasis giving up treatment due to old age, weak constitution, distant recurrence and poor economy, all the remaining 66 cases received open surgery and postoperative pathology diagnosis. The coincidence rate of FNAC with postoperative pathology diagnosis was 91%. In 13 patients with primary pelvis malignant tumors, 11 cases received the surgical resection and pelvic lymph node dissection, followed by postoperative radiotherapy and chemotherapy, and 2 cases gave up treatment. In 41 patients with metastatic malignant, the cytoreductive surgery was not performed in 38 cases due to old age, large lesion extent and surgery difficulty, so the adjuvant chemotherapy was conducted firstly. After chemotherapy, the levels of tumor markers were decreased, the mass volume was reduced, and the ascites decreased or disappeared. For enteritis patients, after anti-inflammation treatment and nutrition support, the symptoms were relieved, and the lumps mass disappeared. For 2 cases with presence of inflammatory cells, the anti-inflammation treatment was performed, and the mass disappeared in the reexamination after 3 months. The remaining cases also received suitable treatments.

## Discussion

FNAC is a method helpful for the definite preoperative pathological diagnosis. In the past, there are some reports on CT-guided FNAC of pelvic cavity masses, but it is restricted due to X-ray radiation and relatively complicated operation. Ultrasound-guided FNAC aspiration has the advantages of real-time monitoring, accurate guidance, minimal invasion, good safety and effectiveness, no X-ray damage, simple operation, short time, low cost and so on [11-13]. It has been widely used in diagnosis of thyroid [14], lymph nodes [15], and pancreatic lesions [16]. In addition, FNAC can be used for diagnosis of pelvic solid tumors [9, 10]. The application of FNAC to diagnosis of mixed cystic and solid masses is rarely reported, and this may be due to the worry about tumor capsule rupture, cystic fluid leakage or implantation metastasis [17, 18].

In this study, FNAC was successfully performed in 65 of 68 patients. The satisfaction rate of sampling was 95.6%. Pathological diagnosis results showed that, in 68 patients, 54 cases (79.4%) had malignant lesions, 4 cases (5.9%) had suspicious malignant lesions, 3 cases (4.4%) had benign lesions, 4 cases (5.9%) had

lesions with undefined nature, and 3 cases (4.4%) had no effective cellular component in the aspirate (existence of blood component). In 54 cases of malignant lesions, there were 13 cases of primary pelvis malignant tumors and 41 cases of metastatic malignant tumors. In 4 cases of suspected malignant lesions, the scattered immature lymphocytes were seen in 2 cases, and the other 2 cases presented papillary epithelial tumor cells. In 4 cases with lesions with undefined nature, only a small amount of degenerative cells were seen. In 3 cases with benign lesions, 1 case presented uterine fibroids combined with partial cystic lesion by postoperatively pathological diagnosis; 2 cases presented inflammatory cells, and the mass disappeared after 3 months of anti-inflammatory treatment. For 3 cases with no effective cellular component in the aspirate, they gave up the treatment due to malignant tumor history and multiple tumor metastases in the whole body. This indicates that, in this study the FNAC can obtain relatively satisfactory outcome.

Ultrasound-guided FNAC can effectively avoid the misdiagnosis of pelvic cystic and solid masses, so it has great significance for the selection of treatment scheme [19]. In this study, excepting 2 cases giving up treatment due to old age, weak constitution, distant recurrence and poor economy, all the remaining 66 cases received surgery. The coincidence rate of FNAC with postoperative pathology diagnosis was 91%, which was higher than 75% in pelvic tumor puncture in the reported literature [20]. In 68 patients, 3 cases did not obtain exact pathological results due to lack of smear cell volume, and the deficiency rate was 4.4%, which was far below 20% in Papathanasiouk *et al*'s study [21] and 7% in Sood *et al*'s study [22]. When the pathological report only shows the descriptive diagnosis due to lack of cell volume, the second puncture should be performed for definite diagnosis. In addition, the sample taking should be performed at the substantial part of mass as far as possible, to avoid the missed diagnosis and misdiagnosis.

In this study, excepting for 1 case of hypoglycemic reaction after puncture, no serious complication occurred in remaining cases. In the puncture process, the choice of appropriate puncture needle should be paid more attention. Too thin puncture needle will lead to too little cell volume, which requires repeated puncture, and may increase the infection and metastasis rate. If the puncture needle is too thick, more blood cells will be taken to the sample, influencing the pathological diagnosis. Correctly selecting the puncture path and avoiding the blood vessels and important organs are also important. In addition, the needle tip position should be real-time displayed, for avoiding the occurrence of complications.

In conclusion, the preoperative ultrasound-guided transabdominal FNAC is a rapid, safe, practical and highly-effective diagnostic method for mixed pelvic cystic solid masses, which is worthy of popularization in primary hospitals. This study still has some limitations. The sample size of this study is relatively small. Larger sample size will make the results more convincing. In our next studies, the sample size should be further increased for obtaining more satisfactory outcomes.

## Disclosure of conflict of interest

None.

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